Oceanography Seminar

Clark Pennelly and Paul G. Myers
Department of Earth and Atmospheric Sciences
University of Alberta, Edmonton, Alberta, Canada

Numerical Modelling in the Labrador Sea: Factors Which Influence Stratification and Deep Convection

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Spanagel Hall, Room 316

The Labrador Sea is one of the few regions which experience deep convection. The water mass transformation which occurs here is of great importance to the global overturning circulation. As the Labrador Sea is relatively inhospitable to directly survey, particularly during the convective winter period, numerical modelling is an excellent tool to explore the processes which occur within. I will present the numerical modelling framework used at the University of Alberta to simulate the Atlantic and Arctic Oceans, as well as a few specific configurations. Afterwards I will discuss my current research which revolves around factors that influence the stratification of the Labrador Sea, specifically freshwater transport and atmospheric variability. I will conclude with some preliminary results from our current sub-mesoscale (1 km) simulation in the Labrador Sea.

We examined the freshwater transport from the boundary into the interior of the Labrador Sea. By calculating the cross-isobath freshwater transport for three water masses, we are able to better understand the regions where freshwater enters the interior of the Labrador Sea. We find that the west coast of Greenland supplies the majority of freshwater to the interior of the Labrador Sea; other regions either act as a sink or supply a very small amount of freshwater. The salty water masses, Labrador Sea Water and Irminger Water, tend to have onshore transport and act to promote a freshening of the Labrador Sea.

We also examine the role of atmospheric variability on the Labrador Sea. From using four different atmospheric forcing datasets to drive our numerical simulation, we calculate how the various air-sea fluxes result with changes in stratification, mixed layer depths, and Labrador Sea Water production. We find that relatively small differences in atmospheric forcing can result with significant changes in heat loss from the Labrador Sea, resulting with dramatic changes in Labrador Sea Water production.